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ABSTRACT

There is a great need for increased competency at technology integration by public school teachers. Among the best ways to encourage assimilation of those skills by pre-service teachers is to model the effective use of technology in both college and clinical classrooms. Pre-service teachers (n=410) were surveyed to determine to what degree their professors and supervising teachers were modeling the use of technology. Questions investigated their perceptions of: utilization of 12 different technologies, i.e., word processing, spreadsheet, database, desktop publishing, electronic presentations, the World Wide Web, e-mail, Galileo (a state-wide database), videodisc, satellite television, a statewide two-way distance learning technology, and Channel 1; and modeling of technology skills by undergraduate teacher program instructors in the areas of core classes, professional education classes, and specialized content for teaching classes. The only technology that was used consistently was word processing. This confirms previous research which showed that word processing is the only classroom technology that educators are comfortable using. Differences among the various major professors' modeling of technology skills were also found. Recommendations are provided for technology modeling and ongoing staff development. (Contains five tables.) (Author/AEF)

Mentoring Pre-Service Teachers for Technology Skills Acquisition

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Abstract: There is a great need for increased competency at technology integration by public school teachers. Among the best ways to encourage assimilation of those skills by pre-service teachers is to model the effective use of technology in both college and clinical classrooms. Four hundred-eleven pre-service teachers were surveyed to determine to what degree were their professors' and supervising teachers' modeling the use of technology. The only technology that was used consistently was wordprocessing. Differences among the various major professors modeling of technology skills were also found.

Introduction

The recent growth of computer use and web-based technology is changing the way our society functions (Jerald, 1998). These tools are influencing the way we think about, access, and use information. In an effort to prepare students for the information age, public schools are increasing access to these tools by putting more hardware and software in schools; connecting schools to the internet; and providing cable and satellite capabilities (Zehr, 1997; Zehr, 1998). However, having access to technology tools is only part of the answer. Teachers must become more knowledgeable about technology, and be able to integrate them into their teaching and student learning. Districts throughout the country are making efforts to increase the use of technology through staff development activities and providing on-going building and district technology support. However, this training must begin with pre-service teacher education (Wetzel, Zambo, Buss, & Arbaugh, 1996).

Pre-service teachers will be the teachers of the 21st century. As such, they must develop the necessary technology knowledge and skills to prepare the next generation of students. If they do not, they will perpetuate the lack of technology expertise that is characteristically the norm of the current generation of teachers. Not acquiring these skills during their pre-service program will cost schools districts greater hardships because they will ultimately have to bear the financial responsibility for expensive staff development activities. The bright side is that in a nationwide study of recent pre-service graduates, the majority felt that they were well prepared to use technology in their teaching (Colon, Willis, Willis, & Austin, 1995).

Technology mentoring must become an essential component of the pre-service development of the potential teacher. Content knowledge and skill development about one's discipline is essential; however, good technology mentoring is only achieved through role modeling, on-going evaluation, constructive criticism, and coaching (Wright & Wright, 1987). Pre-service teachers should be afforded these mentoring elements in their content, methods, and professional education courses; through their classroom observations and experiences; and during their student teaching experiences. It is through these experiences that university professors and supervising teachers help pre-service teachers become knowledgeable about content and methods. However, are these mentors arming their proteges' with the necessary technology tools and skills for the information age (Niederhauser, 1996; Wetzel et al., 1996)?

Research Question

This research reports the findings of a two-year study designed to discover if professors and supervising teachers were modeling technology skills for pre-service teachers, what technologies were used, and were they integrating technology tools and skills into their teaching? The question that guided this research was "What was the impact of faculty in acquiring and motivating technology skills used by pre-service teachers?

Methodology

Instrumentation

To investigate the ways student teachers assimilated and applied technology in their newly chosen profession, a survey of student teachers was conducted. Questions investigated their perceptions of:

- Technology utilization of 12 different technologies by their supervising teacher during student teaching. The 12 technologies that were surveyed were wordprocessing (WP), spreadsheet (SS), database (DB), desktop publishing, electronic presentations (e.g. PowerPoint), the Worldwide Web, email, Galileo (a statewide research database), videodisc, satellite TV (including videotape derivatives), GSAMS (a statewide 2-way audio/video distance learning technology), and Channel 1. Utilization was classified as "Not at all," At least once," "Weekly," and "Daily."
- Modeling of technology skills by undergraduate teacher program instructors in three different areas:
  - Core classes
  - Professional Education classes
  - Specialized Content for Teaching classes.

  These areas were rated on a four (4) point Likert scale (None, A little, A moderate amount, A great deal).

The Core Curriculum is required in all bachelors degree programs and is usually completed during the freshman and sophomore years. The courses total 90 quarter hours and cover areas such as Humanities and Fine Arts, Mathematics and Natural Sciences, Social Sciences, Health and Physical Education, and lower division courses appropriate to the major.

Professional Education courses in the B.S.Ed. curriculum are those which contain the particular knowledge and skill development involved in teaching. Courses in this area typically cover teaching methods, curriculum, learning and motivation, special needs students, and student teaching. This segment usually requires 40 - 45 quarter hours.

Specialized Content for Teaching is the portion of the B.S.Ed. program that prepares the pre-service teacher in the content they will teach in the classroom. In the secondary and P-12 programs, it is equivalent to a major in the teaching field. Fifty to sixty quarter hours are typically required.

The complete survey in PDF format is available at < http://www2.gasou.edu/eltr/tech/rcarlson/stsurvey.pdf>.

To facilitate the analysis, the use of 12 different technologies by faculty was treated as a summative scaled variable - that is, the individual scores for each of the 12 responses were summed to arrive at an overall technology use score. Reliabilities using Chronbach's Coefficient Alpha ranged from 0.89 to 0.91, an indication of very high score reliability.

Subjects

The subjects for this study were graduating seniors from a midsize southern university who completed a survey instrument at the end of their student teaching experience. A total of 444 students participated in the practicum experience during the Spring quarter 1997 through the Spring quarter 1998. Four hundred ten (410) surveys were returned for a 92% return rate. The fact that the survey was included along with the course materials, helped to motivate the return of the surveys.

Results

Sample Demographics

	TOTAL	ECE	EXC	MG	SEC	OTHER
White	79%	76%	82%	80%	81%	83%
Black	17%	21%	18%	16%	14%	13%
Hispanic	1%	1%	0%	1%	2%	4%
Other Ethnic Groups	2%	2%	0%	2%	2%	0%
Female	81%	97%	82%	84%	60%	61%
Male	19%	2%	18%	16%	40%	39%
Note. ECE = Early Childhood Education; EXC = Exceptional Child Education; MG = Middle Grades Education; SEC = Secondary Education; OTH = Other education majors						

Table 1: Sample Demographic Characteristics.

A total of 410 student teachers, predominantly white and female (Table 1), responded to the survey. Early childhood educators were the largest group followed by secondary educators. Special, middle grades, and other educators were about evenly represented. Other educators were classified as those who did not fit into one of the listed categories, such as business, health and physical education, music, and art. Ethnic groups other than white and black were eliminated from further analysis because of their small representation. Age ranged from 20 to 57 years with a median at 23 years and a mode of 22 years.

Modeling of Technology

Supervising Teachers

	Not at All					At Least Once					Weekly					Daily				
Technology	TOT					TOT					TOT					TOT				
	EC	EX	MG	SE	OT	EC	EX	MG	SE	OT	EC	EX	MG	SE	OT	EC	EX	MG	SE	OT
WP	26					25					26					24				
	24	40	26	18	38	26	25	26	23	19	31	23	23	22	21	20	13	26	37	23
DB	70					15					10					6				
	70	88	68	63	63	15	5	17	20	14	12	8	11	8	8	3	0	4	10	14
SS	70					14					9					7				
	70	93	66	60	71	14	5	17	18	12	11	3	9	10	6	5	0	9	12	10
DT Pub	74					13					7					7				
	71	90	72	71	73	17	0	15	11	13	7	10	4	7	4	5	0	9	11	10
Presentation	78					14					6					2				
	83	88	79	64	77	12	8	17	20	13	5	3	4	9	8	0	3	0	8	2
WWW	73					15					7					5				
	74	83	88	64	63	14	13	9	21	14	9	3	4	6	14	4	3	0	10	8
Email	83					7					4					6				
	84	88	94	76	77	5	10	4	11	10	5	3	2	2	4	6	0	0	11	8
Galileo	90					6					2					2				
	91	88	96	86	90	4	10	2	10	8	2	0	2	1	2	2	3	0	3	0
Videodisc	91					7					2					1				
	93	97	89	85	90	4	3	11	10	10	2	0	0	4	0	1	0	0	1	0
TV	74					13					10					3				
	68	88	81	69	88	13	8	17	19	6	16	5	2	8	4	4	0	0	4	2
GSAMS	95					4					1					0				
	95	99	96	94	90	4	0	4	6	6	1	0	0	0	4	0	0	0	0	0
Ch 1	72					6					5					17				
	91	90	63	35	74	5	3	9	9	6	4	5	4	8	4	1	3	24	48	16

Note. All numbers are percent of the total. WP = wordprocessing; DB = database; SS = spreadsheet; DT Pub = desktop publishing; TOT = Total; EC = Early Childhood Education; EX = Exceptional Child Education; MG = Middle Grades Education; SE = Secondary Education; OT = Other education majors.

Table 2: Technology Modeling by Supervising Teachers.

A major factor in the use of technology is the behavior of those near them who are in instructional or supervisory roles. When student teachers were asked about the use of technology by their supervising teachers, very few indicated that technology was used frequently. Of the 12 identified technologies, only 50% or more of the supervising teachers (Table 2) used wordprocessing at least weekly. On the other hand, more than two-thirds of the student teachers reported that their supervising teacher never used any of the technologies except for wordprocessing.

Higher Education Professors

	Av Core	Best Core	Av Prof	Best Prof	Av Spec	Best Spec	Total
WP	2.94	3.12	3.12	3.28	3.02	3.14	18.62
DB	1.96	2.24	2.22	2.60	2.16	2.35	13.53
SS	1.89	2.20	2.09	2.49	2.04	2.26	12.97
DT Publishing	1.72	1.98	1.96	2.30	1.93	2.10	11.99
Presentation	1.96	2.29	2.20	2.61	2.10	2.37	13.53
WWW	2.35	2.55	2.54	2.89	2.45	2.62	15.40
Email	2.35	2.55	2.52	2.81	2.44	2.64	15.31
Galileo	2.10	2.23	2.22	2.42	2.18	2.31	13.46
Videodisc	1.53	1.70	1.55	1.79	1.54	1.60	9.71
TV	1.48	1.56	1.49	1.63	1.47	1.51	9.14
GSAMS	1.18	1.27	1.21	1.28	1.25	1.27	7.46
Channel 1	1.17	1.24	1.22	1.28	1.23	1.21	7.35

Note. WP = wordprocessing; DB = database; SS = spreadsheet; DT Publishing = desktop publishing; Av Core = Average Core Professor; Gr Core = Core Professor Using Technology to the Greatest Extent; Av Prof = Average Professional Education Professor; Gr Prof = Professional Education Professor Using Technology to the Greatest Extent; Av Spec = Av Spec = Average Specialized Content for Teaching Professor; Gr Spec = Specialized Content for Teaching Professor Using Technology to the Greatest Extent.

Table 3: Technology Modeling by Undergraduate Professors.

The student teachers should have been influenced by the way their professors used technology in the classroom. Innovative, motivational uses of technology in the undergraduate teacher education program may motivate the teachers to use it in their own instructional setting. Table 3 shows the average ratings for teachers encountered in teacher preparation programs. Students were asked to rate the average and the best of their professors in core, professional education, and specialized content for teaching classes. Wordprocessing was used to the greatest extent by these professors, followed by internet (WWW and email) usage. Videodiscs, Television, GSAMS, and Channel 1 had the lowest usage.

	Av Core	Gr Core	Av Prof	Gr Prof	Av Spec	Gr Spec
Ethnic	NS	NS	NS	NS	NS	NS
Gender	NS	NS	NS	NS	NS	NS
Major	NS	NS	Sig (.048)	Sig (.004)	Sig (.035)	Sig (.036)
Model	NS	NS	NS	Sig (.006)	NS	NS

Note. Av Core = Average Core Professor; Gr Core = Core Professor Using Technology to the Greatest Extent; Av Prof = Average Professional Education Professor; Gr Prof = Professional Education Professor Using Technology to the Greatest Extent; Av Spec = Average Specialized Content for Teaching Professor; Gr Spec = Specialized Content for Teaching Professor Using Technology to the Greatest Extent; NS = not significant; Sig (xxx) = significant (p value).

Table 4: Significant Differences by Group for Technology Modeling by Undergraduate Professors.

ANOVAs were accomplished to compare student ratings of professor technology use between groups. The dependent variables were scores that were the sum of all the 12 technologies. Chronbach's Alpha reliabilities of these scores ranged from .89 to .91. Table 4 summarizes the comparisons by groups.

There were no statistical differences between males and females or among the ethnic categories. There were differences among the identified majors, however the statistical model was significant only once - in the case of the professors who used technology to the greatest extent. Table 5 shows the total scores adjusted for the effects of the other factors for the various majors.

	Av Core	Gr Core	Av Prof	Gr Prof	Av Spec	Gr Spec
Grand Mean	22.38	24.74	24.30	27.26	23.74	25.41
ECE	.52	.50	.26	-.05	.65	.79
EXC	1.85	1.46	3.00	2.39	2.92	2.61
MG	.16	.73	-1.58	-.32	-.88	-1.11
SEC	-1.00	-.75	-.42	1.28	1.12	-.38
OTHER	-1.63	-2.66	-.98	-3.97	-1.88	-3.27

Note. Av Core = Average Core Professor; Gr Core = Core Professor Using Technology to the Greatest Extent, Av Prof = Average Professional Education Professor; Gr Prof = Professional Education Professor Using Technology to the Greatest Extent; Av Spec = Average Specialized Content for Teaching Professor; Gr Spec = Specialized Content for Teaching Professor Using Technology to the Greatest Extent; ECE = Early Childhood Education; EXC = Exceptional Child Education; MG = Middle Grades Education; SEC = Secondary Education; OTHER = Other education majors.

Table 5: Deviation from the Grand Mean by Group for Technology Modeling by Undergraduate Professors.

In every case, students majoring in Exceptional Childhood Education rated technology use by their professors higher than those majoring in other disciplines did. Similarly, students classified as "other" rated their professors lower than those in other disciplines.

In the case of professors in professional education classes who used technology to the greatest extent, students majoring in Exceptional Childhood and Secondary Education rated their professors above average, while those classified as "other" rated their professors well below the average.

To test the hypothesis that there were differences among the way students rated the professors, a repeated measures ANOVA was accomplished. Pillais, Hotelings, and Wilkes tests showed significance ($F=2,28$, $df= 5$, $p=0.47$). Within group variables were the six professor groupings and the between group variables were ethnicity, gender, and major. The within factor significance was $p=0.33$ ($F=2.44$, $df=5$). The professional education professors who used technology to the greatest extent averaged a significantly higher mean score than any of the other professors.

Discussion

This study confirms previous research which showed that the only classroom technology that educators are comfortable using is wordprocessing (Wetzel,1993). This was the only technology used at least once per week by 50% of the supervising teachers. The next highest technology type was Channel 1, used at least weekly by only 22 % of the supervising teachers. Access to technology may have limited supervising teachers from using technology to a greater extent than they did. Similarly, student teachers rated the modeling of technology by their professors at least 3 on a 4-point scale only for wordprocessing. The closest next technology was internet related and was one-half point lower on average.

Most technology is underutilized; therefore, student teachers have little opportunity to see it modeled in their college classroom setting by their university professors or in their practicum setting by their supervising teachers. If student teachers are not shown how to use technology they should not be expected to integrate it into their lessons. This encourages the continued underuse of tools that have great potential to help students learn.

When asked to rate their university professors on modeling technology use, student teachers rated their professional educational professors highest, followed by specialized content professors, and lastly core professors. This is somewhat concerning in that core and content area teachers may be underutilizing important teaching tools. When looking at technology modeling by major, students studying Exceptional Childhood Education rated all of their professors higher than any of the other majors. Conversely, other majors rated their professors lowest. Looking at the rating of the Core professors which should be equally rated, one finds that Exceptional Childhood Education majors rated these professors high and other majors rated these professors the lowest. However, these ratings showed no statistical difference. The only statistical difference was for the professional education professors who used technology to the greatest extent.

Recommendations and Conclusion

Although Colleges of Education should continue to emphasize the use of technology as a teaching tool in all of their pre-service educational programs, it should be understood that it must be a university-wide mandate. It is imperative that technology modeling and use also take place in core and specialized content area courses. To achieve this, professors must have technology access not only in their offices, but also in their classrooms. They must also have technology support when needed. Colleges should also provide on-going, small group or one-to-one staff development activities for professors.

When considering student teacher placement, the technology awareness of the supervising teacher and his/her colleagues should be one criterion for selection. Another should be the level of access the student teacher will have during the experience.

Supervising teachers must begin to view student teachers as a technology resource because of their familiarity and comfort level with the technology. For instance, when preparing lessons, make it the student teacher's responsibility to integrate one or more technologies.

Finally, colleges of education and/or individual departments should sponsor activities where student teachers and their supervising teachers demonstrate and celebrate the integration of technology into teaching and learning. Besides providing an opportunity for student teachers and supervising teachers to "show-off," it would also be an opportunity for professors to see innovative ways to integrate technology into their teaching; thereby raising their learning curve.

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